N87-17607

THE VERTICAL STRUCTURE OF JUPITER'S EQUATORIAL AND TROPICAL REGIONS

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The presentation by Smith is largely contained in a paper which appears in the special issue of *Icarus* (1986; 65, 264-279). The abstract of the conference presentation is reproduced here:

The complex designs of the Jovian atmosphere can only be understood by examining the planet with every means at our disposal: building unified model atmospheres which are capable of explaining data taken through diverse spectral filters in the continuum, within the absorption bands of selected molecules, and through polarizing filters. At present the synthesis of observational data can only be done for large well-defined features since the various data are taken by different observers usually years apart in time. I have been analyzing two very different data sets which contain information on levels of the atmosphere down to several bars: the Pioneer polarimetry (Smith and Tomasko, 1984, Icarus *58, 35-73) and the methane band images of R. West (1979,* Icarus *38, 12-33). When the same model structures are run for both data sets it is encouraging to find that the two-cloud model with a thin overlying haze works well in constraining a large number of available parameters. When the same models are tried on the analysis of hydrogen quadrupole lines (Cunningham and Hunten, 1984,* Bull. AAS *16) and also on 5 micron radiation (Bjoracker, 1984, PhD diss., U. Ariz), a unified picture begins to develop. The lower cloud deck is at a pressure level of 2 bars while the upper cloud deck is distributed between about 230 and 700 mb. This upper cloud deck is very likely to be ammonia crystals and has been characterized by an analytic phase function since Mie scattering calculations are not appropriate for nonspherical particles. Above the upper cloud is a thin haze with an optical depth of a few tenths near the 120 mb level. The major difference found between the belt and zone features is the compositional change which causes the lower single scattering albedo in the belts. The belts are also found to have less optical depth in the upper cloud. An optical depth of 7 may be typical for the NTrZ while the SEB model fits the available methane data best with half that value. An earlier model which hypothesized that the ammonia cloud was missing in the belts (Owen and Terrile, 1981,* J. Geophys. Res. *86, 8787-8814) gives wildly inaccurate predictions for the observations of the belt polarization. Another morphological difference is the extension of the upper cloud to high altitudes in both the EqZ and the GRS; the haze and cloud material can be clearly differentiated in the polarization models because the cloud is slightly negatively polarizing while the haze needs to be strongly positively polarizing.*

UNIDENTIFIED QUESTIONER, DR. X: One question I had was that your predicted base level for the upper cloud seems to be a lot higher than that predicted by other models. Does your analysis still assume that it is predominantly an ammonia ice cloud in the upper layer?

DR. SMITH: You mean at 700 millibars.

DR. X: Right--700 millibars and below.

DR. SMITH: Well, as far as I know, 700 millibars should be the bottom of the ammonia cloud based on the vapor pressure.

DR. X: So it was based on vapor...

DR. SMITH: Yes. It's fixed there. It's assumed to be ammonia and it's evaporating below that level.